

8. REGULATIONS AND ADVISORIES

Available information on international, national, and state regulations and standards of pyrethrins and pyrethroids is presented in Table 8-1. Information concerning tolerances for residues of pyrethrin and selected pyrethroids is presented in Table 8-2.

ATSDR has not derived acute-, intermediate-, or chronic-duration inhalation MRLs for pyrethrins or pyrethroids because adequate data were not available by this route of exposure.

ATSDR derived an acute-duration oral MRL of 0.0007 mg/kg/day for bioallethrin (Type I pyrethroid). This MRL is based on a LOAEL of 0.21 mg/kg/day for neurodevelopmental effects in mice. An uncertainty factor of 300 was used (10 for use of a LOAEL, 10 for animal to human extrapolation, and 3 to account for intrahuman variation) to derive the MRL.

ATSDR derived an acute-duration oral MRL of 0.002 mg/kg/day for deltamethrin (Type II pyrethroid). This MRL is based on a LOAEL of 0.7 mg/kg/day for neurodevelopmental effects in mice. An uncertainty factor of 300 was used (10 for use of a LOAEL, 10 for animal to human extrapolation, and 3 to account for intrahuman variation) to derive the MRL.

ATSDR has not derived intermediate or chronic oral MRLs for pyrethrins or pyrethroids because animal studies in which health effects were assessed following oral administration of various pyrethroids for intermediate or chronic durations identified LOAELs that were higher than the LOAELs of 0.021 and 0.7 mg/kg/day for neurodevelopmental effects in mice following acute-duration oral exposure to bioallethrin and deltamethrin, respectively.

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Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids

Agency	Description	Information	References
<u>INTERNATIONAL</u>			
Guidelines:			
IARC	Carcinogenic classification Deltamethrin Fenvalerate Permethrin	Group 3 ^a	IARC 2001
WHO	Drinking water guideline Permethrin	20 µg/L	WHO 2001
<u>NATIONAL</u>			
Regulations and Guidelines:			
a. Air			
ACGIH	TLV-TWA—pyrethrum	5 mg/m ³	ACGIH 2000
NIOSH	REL (TWA)—pyrethrum IDLH—pyrethrum	5 mg/m ³ 5,000 mg/m ³	NIOSH 2001
OSHA	PEL (8-hour TWA)—pyrethrum General industry (total dust)	5 mg/m ³	OSHA 2001a 29CFR1910.1000 Table Z-1
	PEL (8-hour TWA)—pyrethrum Construction industry (total dust)	5 mg/m ³	OSHA 2001c 29CFR1926.55 Appendix A
	PEL (8-hour TWA)—pyrethrum Shipyard industry (total dust)	5 mg/m ³	OSHA 2001b 29CFR1915.1000 Table Z
b. Water			
EPA	Water pollution; determination of reportable quantity—pyrethrin	1 pound	EPA 2001c 40CFR117.3
	Water pollution; designation of hazardous substance—pyrethrin		EPA 2001a 40CFR116.4
	NPDES; toxic pollutants and hazardous substances required to be identified by existing dischargers if expected to be present—pyrethrins		EPA 2001d 40CFR122 Appendix D

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Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids (*continued*)

Agency	Description	Information	References
<u>NATIONAL (cont.)</u>			
c. Food			
FDA	Pyrethrins in combination with piperonyl butoxide may be safely used for insect control on bags intended for use in contact with dried food		FDA 2000a 21CFR178.3720
USDA	Labeling treated seed—"don't use for food, feed, or oil purposes"		USDA 2001b 7CFR201.31a(d)
	Pyrethrins		
	Oat	1 ppm	
	Sorghum	3 ppm	
d. Other			
ACGIH	Carcinogenicity classification—pyrethrum	A4 ^b	ACGIH 2000
DOT	Superfund—reportable quantity		DOT 2001 49CFR172.101
	Pyrethrins	1 pound	Appendix A
EPA	RfD (mg/kg/day)		IRIS 2001e
	Type I Pyrethroids		
	Biphenothrin	1.5x10 ⁻²	
	Permethrin	5.0x10 ⁻²	
	Resmethrin	3.0x10 ⁻²	
	Type II Pyrethroids		
	Baythroid/Cyfluthrin	2.5x10 ⁻²	
	Cyhalothrin/Karate	5.0x10 ⁻³	
	Cypermethrin	1.0x10 ⁻²	
	Danitol/Fenpropothrin	2.5x10 ⁻²	
	Fluvalinate	1.0x10 ⁻²	
	Pydrin/Fenvalerate	2.5x10 ⁻²	
	Tralomethrin	7.5x10 ⁻³	
	Superfund—reportable quantity		EPA 2001b 40CFR302.4
	Pyrethrins	1 pound	
	Toxic chemical release reporting; Community Right-to-Know—effective date		EPA 2001e 40CFR372.65
	Fenvalerate	01/01/95	
	Permethrin	01/01/95	

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Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids (*continued*)

Agency	Description	Information	References
<u>NATIONAL (cont.)</u>			
FDA	New animal drug—for use in the treatment of ear mites in dogs and cats	0.05% pyrethrins	FDA 2000b 21CFR524.2140
<u>STATE</u>			
Regulations and Guidelines:			
a. Air			
Alaska	Air contaminant standard (TWA) Pyrethrum	5 mg/m ³	BNA 2001
California	Airborne contaminant—pyrethrum		BNA 2001
Connecticut	HAP—pyrethrum		BNA 2001
Hawaii	Air contaminant—pyrethrum PEL STEL	5 mg/m ³ 10 mg/m ³	BNA 2001
Idaho	Toxic air pollutants—pyrethrum OEL EL AAC	5 mg/m ³ 3.33×10^{-1} pounds/hour 0.25 mg/m ³	BNA 2001
Kentucky	Air quality—pyrethrum TAL Averaging time Significant levels	20.0 mg/m ³ 8 hours 1.276×10^{-3} pounds/hour	BNA 2001
Michigan	Air contaminant—maximum allowable concentrations Pyrethrum	5 mg/m ³	BNA 2001
	Air contaminant (PEL-TWA) Pyrethrum	5 mg/m ³	BNA 2001
Montana	Occupational air contaminant (TLV) Pyrethrum	5 mg/m ³	BNA 2001
New Hampshire	Toxic air pollutants Pyrethrum	5 mg/m ³	BNA 2001
New Mexico	Toxic air pollutants—pyrethrum OEL Emissions	5.05 mg/m ³ 3.33×10^{-1} pounds/hour	BNA 2001

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Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids (*continued*)

Agency	Description	Information	References
<u>STATE (cont.)</u>			
New York	Air contaminant (TLV) Pyrethrum	5 mg/m ³	BNA 2001
Oregon	Air contaminant (TLV) Pyrethrum	5 mg/m ³	BNA 2001
South Carolina	Toxic air emissions—pyrethrum Maximum allowable concentration	50 µg/m ³	BNA 2001
Washington	Toxic air pollutants (ASIL 24-hour average) Pyrethrum	1.7 µg/m ³	BNA 2001
Wisconsin	Emission limits—pyrethrum <25 feet emission point >25 feet emission point	4.176x10 ⁻¹ pounds/hour 1.7520 pounds/hour	BNA 2001
b. Water			
Arizona	Drinking water guideline Fenvalerate	180 µg/L	HSDB 2001
Florida	Drinking water guideline Permethrin Cypermethrin	350 µg/L 700 µg/L	HSDB 2001
c. Food			
d. Other			
California	Pesticide registration—active ingredients Flualinate Permethrin Pyrethrins Resmethrin		BNA 2001
	Hazardous substance Pyrethrins Pyrethrum		BNA 2001
Florida	Toxic substances in the workplace—pyrethrum		BNA 2001

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Table 8-1. Regulations and Guidelines Applicable to Pyrethrins and Pyrethroids (*continued*)

Agency	Description	Information	References
<u>STATE (cont.)</u>			
Georgia	Regulated substances and soil concentrations that trigger notification Pyrethrin I Pyrethrin II Pyrethrins and Pyrethroids Pyrethrum Pyrethrum I		BNA 2001
Massachusetts	Containers adequately labeled pursuant to federal law—pyrethrum Oil and hazardous material Pyrethrin 1 Pyrethrin 2 Pyrethrins Pyrethroids Pyrethrum		BNA 2001
Minnesota	Hazardous substance—pyrethrum		BNA 2001
New Jersey	Hazardous substance Permethrin Phenoxypropane Pyrethrin I Pyrethrin II Pyrethrum Resmethrin Tetramethrin		BNA 2001

^aGroup 3: not classifiable as to its carcinogenicity to humans

^bA4: not classifiable as a human carcinogen

AAC = acceptable ambient concentrations; ACGIH = American Conference of Governmental Industrial Hygienists; ASIL = acceptable source impact levels; CFR = Code of Federal Regulations; DOT = Department of Transportation; EL = emissions levels; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; HAP = hazardous air pollutant; HSDB = Hazardous Substances Data Bank; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life and health; NIOSH = National Institute of Occupational Safety and Health; NPDES = National Pollutant Discharge Elimination System; OEL = occupational exposure limit; OSHA = Occupational Safety and Health Administration; PEL = permissible exposure limit; REL = recommended exposure limit; RfD = oral reference dose; STEL = short-term exposure limit; TAL = threshold ambient limits; TLV = threshold limit value; TWA = time-weighted average; USDA = United States Department of Agriculture; WHO = World Health Organization

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cyper-methrin	Delta-methrin	Fenprop-athrin	Fenval-erate	Fluvali-nate	Tralo-methrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
	—	—	25.0	—	—	—	—	—	—
Alfalfa, fresh	—	—	55.0	—	—	—	—	—	—
Alfalfa, hay	—	—	0.05	—	—	—	15.0	—	—
Almond hulls	—	—	20.0	—	—	—	0.2	—	—
Almonds	1.0	—	0.05	—	—	—	2.0	—	—
Apples	1.0	4.0	10.0	—	—	—	0.2	—	—
Artichokes	—	—	1.0	—	—	—	—	—	—
Asparagus	—	—	1.0	—	—	—	—	—	—
Avocados	—	—	1.0	—	—	—	—	—	—
Barley	3.0	2.0	—	—	—	—	—	—	—
Beans	1.0	—	—	—	—	—	—	—	—
Beans, dried	—	—	—	—	—	—	0.25	—	—
Beans, snap	—	—	—	—	—	—	2.0	—	—
Birdseed mixtures	3.0	—	—	—	—	—	—	—	—
Blackberries	1.0	4.0	—	—	—	—	—	—	—
Blueberries	1.0	4.0	—	—	—	—	3.0	—	—
Boysenberries	1.0	4.0	—	—	—	—	—	—	—
Brassica, head and stem	—	—	—	2.0	—	3.0	—	—	—
Brassica, leafy	—	—	—	14.0	—	—	—	—	—
Broccoli	—	—	1.0	—	—	—	2.0	—	0.5
Brussels sprouts	—	—	1.0	—	—	—	—	—	—
Buckwheat	3.0	—	—	—	—	—	—	—	—

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Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm) (continued)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cyper-methrin	Delta-methrin	Fenprop-athrin	Fenvalerate	Fluvali-nate	Tralo-methrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
Cabbage	—	—	6.0	—	—	—	10.0	—	—
Cranberries	—	—	—	—	—	—	3.0	—	—
Cantaloupes	—	—	—	—	—	—	1.0	—	—
Carrots	—	—	—	—	—	—	0.5	—	—
Cattle, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—
Cattle, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Cattle, meat byproducts	0.1	—	2.0	0.05	—	0.1	1.5	0.01	—
Cauliflower	—	—	1.0	—	—	—	0.5	—	—
Celery	—	—	5.0	—	—	—	—	—	—
Cherries	1.0	4.0	3.0	—	—	—	—	—	—
Citrus, dried pulp	—	—	—	—	—	4.0	—	—	—
Citrus, oil	—	—	—	—	—	75.0	—	—	—
Cocoa beans	1.0	—	—	—	—	—	—	—	—
Coffee	—	—	—	—	—	—	—	0.01	—
Collards	—	—	20.0	—	—	—	10.0	—	—
Copra	1.0	—	—	—	—	—	—	—	—
Corn, fodder	—	—	60.0	—	—	—	50.0	—	—
Corn, forage	—	—	60.0	—	—	—	50.0	—	—
Corn, grain	—	2.0	0.05	—	—	—	0.02	—	—
Corn, including popcorn	3.0	—	—	—	—	—	—	—	—
Corn, sweet, kernels and cobs	—	—	0.1	—	—	—	0.1	—	—
Cottonseed	1.0	—	0.5	0.5	0.04	1.0	0.2	0.1	0.02

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Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm) (continued)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cyper-methrin	Delta-methrin	Fenprop-athrin	Fenva-lerate	Fluvali-nate	Tralo-methrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
Cottonseed, hulls	—	—	—	—	—	—	—	0.3	—
Cottonseed oil	—	—	—	—	0.2	3.0	—	1.0	0.2
Crabapples	1.0	4.0	—	—	—	—	—	—	—
Cucumbers	—	—	—	—	—	—	0.5	—	—
Currants	1.0	4.0	—	—	—	—	3.0	—	—
Dewberries	1.0	4.0	—	—	—	—	—	—	—
Eggplant	—	—	1.0	—	—	—	1.0	—	—
Eggs	0.1	—	1.0	—	—	0.05	—	0.01	—
Elderberries	—	—	—	—	—	—	3.0	—	—
English walnuts	—	—	—	—	—	—	0.2	—	—
Figs	1.0	4.0	—	—	—	—	—	—	—
Filberts	—	—	0.05	—	—	—	0.2	—	—
Flaxseed	1.0	—	—	—	—	—	—	—	—
Fruits, citrus, crop group 10	—	—	—	—	—	2.0	—	—	—
Fruits, pome, crop group 11	—	—	—	—	—	5.0	—	—	—
Garlic	—	—	0.1	—	—	—	—	—	—
Goats, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—
Goats, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Goats, meat byproducts	0.1	—	2.0	0.05	—	0.1	1.5	0.01	—
Gooseberries	1.0	4.0	—	—	—	—	3.0	—	—
Grain, sorghum	1.0	2.0	—	—	—	—	—	—	—
Grapes	—	4.0	—	—	—	5.0	—	—	—

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm) (continued)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cyper-methrin	Delta-methrin	Fenprop-athrin	Fenva-lerate	Fluvali-nate	Tralo-methrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
	—	—	15.0	—	—	—	—	—	—
Grasses, range	—	4.0	—	—	—	—	—	—	—
Guavas	—	—	—	—	—	—	—	—	—
Hogs, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—
Hogs, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Hogs, meat byproducts	0.1	—	3.0	0.05	—	0.1	1.5	0.01	—
Honey	—	—	—	—	—	—	—	0.05	—
Honeydew melons	—	—	—	—	—	—	1.5	—	—
Horseradish	—	—	1.0	—	—	—	—	—	—
Horses, fat	0.1	—	3.0	0.05	—	1.0	1.5	0.01	—
Horses, meat	0.1	—	0.25	0.05	—	0.1	1.5	0.01	—
Horses, meat byproducts	0.1	—	2.0	0.05	—	0.1	1.5	0.01	—
Huckleberries	—	4.0	—	—	—	—	3.0	—	—
Kiwifruit	—	—	2.0	—	—	—	—	—	—
Leafy vegetables, except Brassica	—	—	20.0	—	—	—	—	—	—
Lettuce, head	—	—	20.0	10.0	—	—	—	—	1.0
Lettuce, leaf	—	—	—	—	—	—	—	—	3.0
Loganberries	1.0	4.0	—	—	—	—	—	—	—
Mangoes	1.0	4.0	—	—	—	—	—	—	—
Milk	—	—	—	0.05	—	—	0.3	0.01	—
Milk, fat	0.5	—	6.25	—	—	2.0	7.0	—	—
Milo	—	2.0	—	—	—	—	—	—	—
Mushrooms	—	—	6.0	—	—	—	—	—	—

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Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm) (continued)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cyper-methrin	Delta-methrin	Fenprop-athrin	Fenvale-rate	Fluvali-nate	Tralo-methrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
Muskmelons	1.0	4.0	—	—	—	—	1.0	—	—
Oats	1.0	2.0	—	—	—	—	—	—	—
Okra	—	—	—	—	—	—	0.1	—	—
Onion, bulb	—	—	0.1	0.10	—	—	—	—	—
Onions, green	—	—	—	6.0	—	—	—	—	—
Oranges	1.0	4.0	—	—	—	—	—	—	—
Papayas	—	—	1.0	—	—	—	—	—	—
Peaches	1.0	4.0	5.0	—	—	—	—	—	—
Peanut, hay	—	—	—	—	—	—	20.0	—	—
Peanut, nutmeat	—	—	—	—	—	—	0.01	—	—
Peanuts	—	—	—	—	—	—	—	0.02	—
Peanuts, with shell removed	1.0	—	—	—	—	—	—	—	—
Pears	1.0	4.0	3.0	—	—	—	—	2.0	—
Peas	1.0	—	—	—	—	—	—	1.0	—
Peas, dried	—	—	—	—	—	—	—	0.25	—
Pecans	—	—	—	0.05	—	—	—	0.2	—
Peppers	—	—	—	—	—	—	—	1.0	—
Peppers, bell	—	—	1.0	—	—	—	—	—	—
Pineapples	1.0	4.0	—	—	—	—	—	—	—
Pistachios	—	—	0.1	—	—	—	—	—	—
Plums	1.0	4.0	—	—	—	—	—	—	—
Potatoes	0.05	—	0.05	—	—	—	—	0.02	—
Poultry, fat	0.2	—	0.15	—	—	—	0.05	—	0.01

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Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm) (continued)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cyper-methrin	Delta-methrin	Fenprop-athrin	Fenva-lerate	Fluvali-nate	Tralo-methrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
	Poultry, meat	0.2	—	0.05	—	—	0.05	—	0.01
Poultry, meat byproducts	0.2	—	0.25	—	—	—	0.05	—	0.01
Pumpkins	—	—	—	—	—	—	—	1.0	—
Radish, roots	—	—	—	—	—	—	—	0.3	—
Radish, tops	—	—	—	—	—	—	—	8.0	—
Raisins	—	—	—	—	—	—	10.0	—	—
Raspberries	1.0	4.0	—	—	—	—	—	—	—
Rice	3.0	—	—	—	—	—	—	—	—
Rye	3.0	2.0	—	—	—	—	—	—	—
Sheep, fat	0.1	—	3.0	0.05	—	—	1.0	1.5	0.01
Sheep, meat	0.1	—	0.25	0.05	—	—	0.1	1.5	0.01
Sheep, meat byproducts	0.1	—	2.0	0.05	—	—	0.1	1.5	0.01
Soybeans	—	—	—	—	—	—	—	0.05	—
Soybean hulls	—	—	0.05	—	—	—	—	1.0	—
Spinach	—	—	20.0	—	—	—	—	—	—
Squash/cucumber subgroup	—	—	—	—	—	—	0.5	—	—
Stone fruits	—	—	—	—	—	—	—	10.0	—
Strawberry	—	—	—	—	—	—	2.0	—	—
Sugarcane	—	—	—	—	—	—	—	2.0	—
Summer squash	—	—	—	—	—	—	—	0.5	—
Sunflower seed	—	—	—	—	—	—	—	1.0	—
Sweet potatoes	0.05	—	—	—	—	—	—	—	0.05

Table 8-2. Tolerances for Residues Applicable to Pyrethrins and Pyrethroids (ppm) (continued)

	Type I Pyrethroids			Type II Pyrethroids					
	Pyrethrin	Allethrin	Per-methrin	Cyper-methrin	Delta-methrin	Fenprop-athrin	Fenvale-rate	Fluvali-nate	Tralo-methrin
	40CFR 180.128	40CFR 180.113	40CFR 180.378	40CFR 180.418	40CFR 180.435	40CFR 180.466	40CFR 180.379	40CFR 180.427	40CFR 180.422
	Tomatoes	1.0	4.0	2.0	—	0.2	0.6	1.0	—
Tomato (products) concentrated	—	—	—	—	0.1	—	—	—	—
Turnip greens	—	—	20.0	—	—	—	—	—	—
Turnip roots	—	—	1.0	—	—	—	0.5	—	—
Turnip tops	—	—	—	—	—	—	20.0	—	—
Vegetables, curcurbit	—	—	3.0	—	—	0.5	—	—	—
Walnuts	1.0	—	0.05	—	—	—	—	—	—
Watercress	—	—	5.0	—	—	—	—	—	—
Watermelons	—	—	—	—	—	—	1.0	—	—
Wheat	3.0	2.0	—	—	—	—	—	—	—
Winter squash	—	—	—	—	—	—	1.0	—	—

Source: EPA 2001f